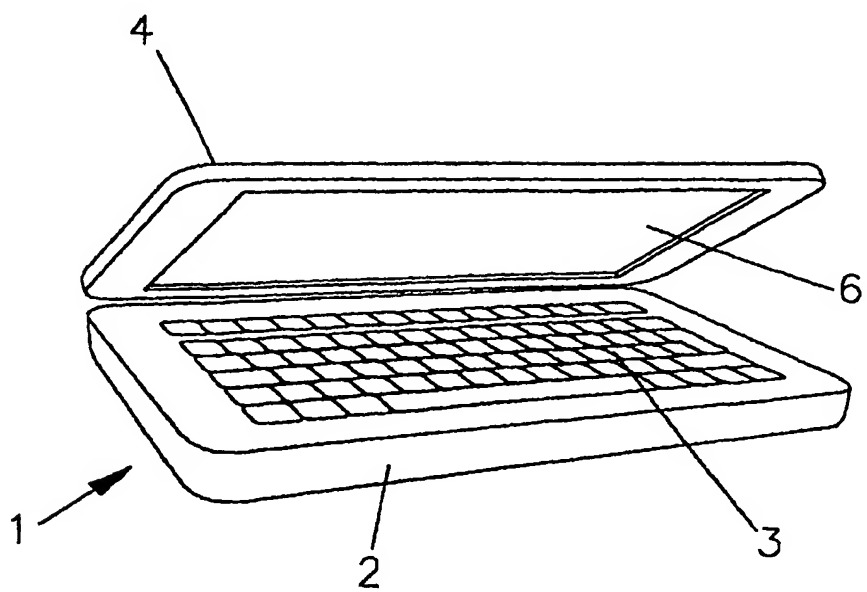




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>7</sup> :</b> <b>H04R 1/02, H04M 1/03, G06F 1/16,</b> <b>H04R 7/04</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 00/69212</b> <b>(43) International Publication Date:</b> 16 November 2000 (16.11.00)
<b>(21) International Application Number:</b> PCT/GB00/01427 <b>(22) International Filing Date:</b> 25 April 2000 (25.04.00) <b>(30) Priority Data:</b> 9909157.1                      22 April 1999 (22.04.99)                      GB <b>(71) Applicant (for all designated States except US):</b> NEW TRANS- DUCERS LIMITED [GB/GB]; Ixworth House, 37 Ixworth Place, London SW3 3QH (GB). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> COLLOMS, Martin [GB/GB]; 22 Burgess Hill, London NW2 2DA (GB). AZIMA, Henry [CA/GB]; 3 Southacre Close, Chaucer Road, Cambridge (GB). <b>(74) Agent:</b> MAGUIRE BOSS; 5 Crown Street, St. Ives, Cam- bridgeshire PR27 5EB (GB).		<b>(81) Designated States:</b> AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i>
<b>(54) Title:</b> SMALL ELECTRONIC ARTICLES FOR PERSONAL USE  <div style="text-align: center;">  </div> <b>(57) Abstract</b> <p>A personal portable electronic article having a body or casing in or on which a loudspeaker is mounted, characterised by a bending wave acoustic radiator and a vibration exciter mounted on the radiator to vibrate the radiator to produce an acoustic output, in that the radiator is formed integrally with the body or casing as an injection moulding and in that the radiator defines a sub-area of the body or casing.</p>		

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5        TITLE:        SMALL ELECTRONIC ARTICLES FOR PERSONAL USE

10                                DESCRIPTION

15                                TECHNICAL FIELD

The invention relates to small electronic articles for personal use, such for example, as mobile telephones, personal organisers and pocket radios.

It is an object of the invention to provide means  
20 whereby such electronic articles can be made to have an audio output without substantially adding to the weight or bulk of the article.

DISCLOSURE OF INVENTION

25        According to the invention, there is provided a personal portable electronic article having a body or casing in or on which a loudspeaker is mounted, characterised by a bending wave acoustic radiator and a

vibration exciter mounted on the radiator to vibrate the radiator to produce an acoustic output, in that the radiator is formed integrally with the body or casing as an injection moulding and in that the radiator defines a sub-area of the body or casing. Thus the personal portable electronic article is sufficiently small to be hand-held.

The radiator may be co-moulded integrally with the body or casing.

10 The radiator may be transparent and may, for example, define a display screen area.

The article may be a communications device, e.g. a cellular telephone.

The radiator may be a distributed mode acoustic radiator speaker e.g. of the kind described in WO97/09842.

#### BRIEF DESCRIPTION OF DRAWINGS

The invention is diagrammatically illustrated, by way of example, in the accompanying drawings, in which:-

Figure 1 is a front perspective view of a personal organiser incorporating a loudspeaker;

Figure 2 is a rear perspective view of the organiser shown in Figure 2;

25 Figure 3 is a front perspective view of a mobile telephone, and

Figure 4 is a rear perspective view of the telephone of Figure 4.

Figure 5 is a perspective view of a further embodiment of mobile telephone, and

Figure 6 is a partial cross-section through the casing of the mobile telephone of Figure 5.

5

#### BEST MODES FOR CARRYING OUT THE INVENTION

The personal organiser (1) shown in Figures 1 and 2 comprises a body (2) having a keyboard (3) and a lid (4) hinged to the body (2) and adapted to cover the keyboard, 10 the lid incorporating a visual display screen (6). The lid (4) is injection moulded from a suitable plastics material and comprises an integrally moulded bending wave acoustic radiator (12) driven by a vibration exciter (9) to form a loudspeaker, e.g. of the kind generally described in 15 WO97/09842.

Figures 3 and 4 show a mobile telephone (7) having a casing or body (8) having a front face (10) formed with a display panel (16) and a keypad (17). The rear face (11) of the casing of the telephone is formed integrally by 20 injection moulding with a bending wave acoustic radiator (12) driven by a piezo electric transducer or vibration exciter (9) to form a loudspeaker e.g. of the kind described in WO97/09842.

Thus in the arrangements of Figures 1 to 4 the casing 25 or body of the personal portable electronics article is injection moulded from plastics and a generally rectangular relatively thin acoustically active sub area of the casing or body is integrally moulded into the casing or body and

is bounded e.g. by a groove to provide a resilient suspension or alternatively by a thickened area or ridge to define the boundary of the panel. Slots (not shown) may be provided in the groove (18) and which pierce through the body or casing to increase the compliance of the suspension provided by the groove. Alternatively a resilient suspension, e.g. of elastomer may be co-moulded with the casing or body and the radiator panel can also be co-moulded directly on to the suspension.

10 In the mobile telephone (27) shown in Figures 5 and 6, which is generally similar to that of Figures 3 and 4, a front casing part (20) of the device (27) is formed with an acoustic radiator (X) including a transparent cover (19) over a visual display (16) which is excited by an inertial  
15 electrodynamic vibration exciter (9)

The invention thus provides a simple method of directly incorporating loudspeakers in small personal portable electronics articles.

CLAIMS

1. A personal portable electronic article having a body or casing in or on which a loudspeaker is mounted,  
5 characterised by a bending wave acoustic radiator and a vibration exciter mounted on the radiator to vibrate the radiator to produce an acoustic output, in that the radiator is formed integrally with the body or casing as an injection moulding and in that the radiator  
10 defines a sub-area of the body or casing.
2. A personal portable electronic article according to claim 1, characterised in that the radiator is co-moulded integrally with the body or casing.
3. A personal portable electronic article according to  
15 claim 1 or claim 2, characterised in that the radiator is transparent.
4. A personal portable electronic article according to any one of claims 1 to 3, characterised in that the article is a communications device.
- 20 5. A personal portable electronic article according to claim 4, characterised in that the communications device is a cellular telephone.

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Figure 1

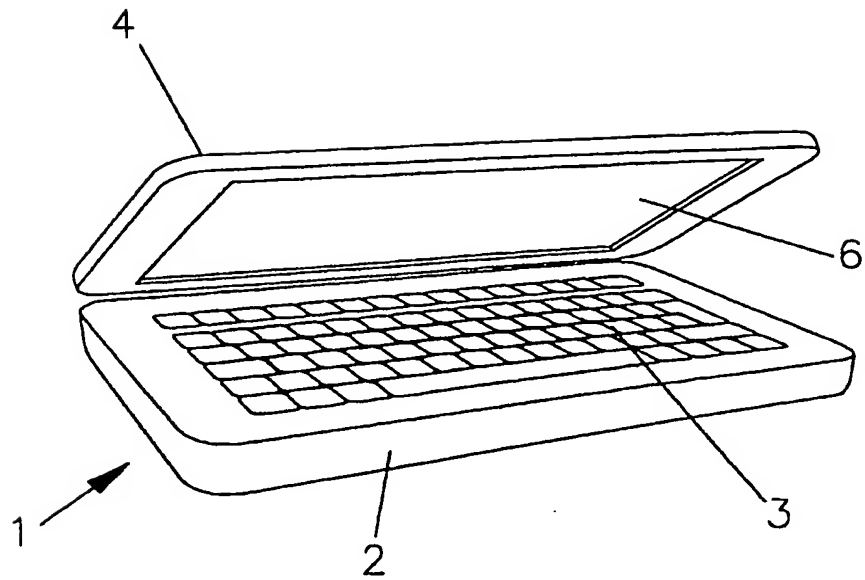
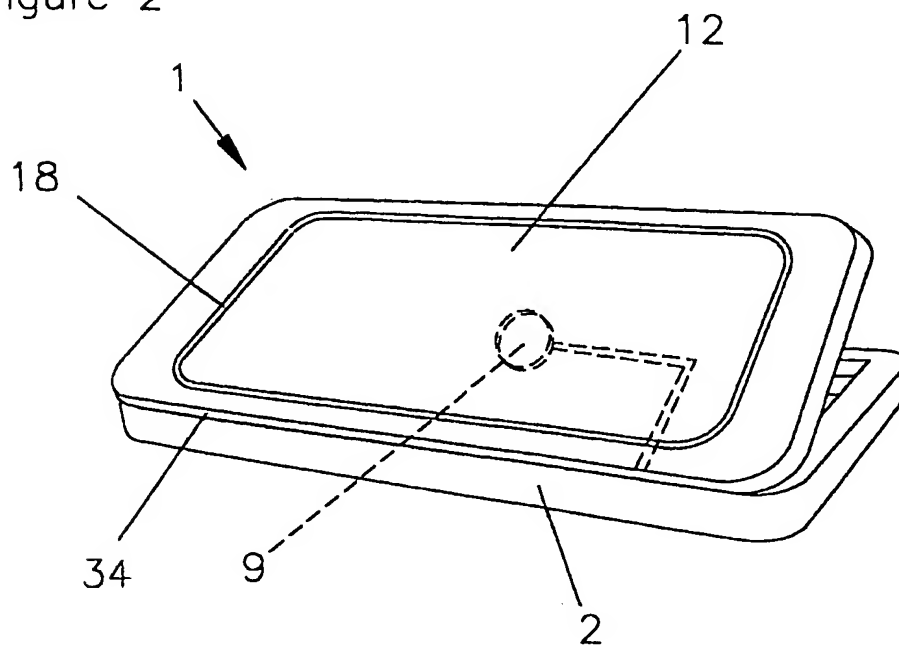


Figure 2





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Figure 3

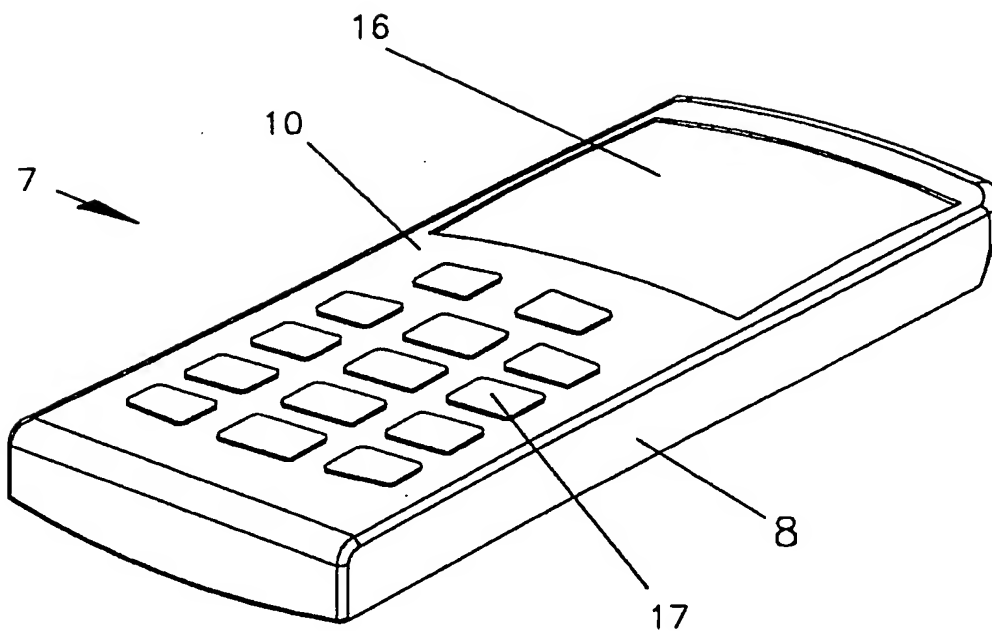
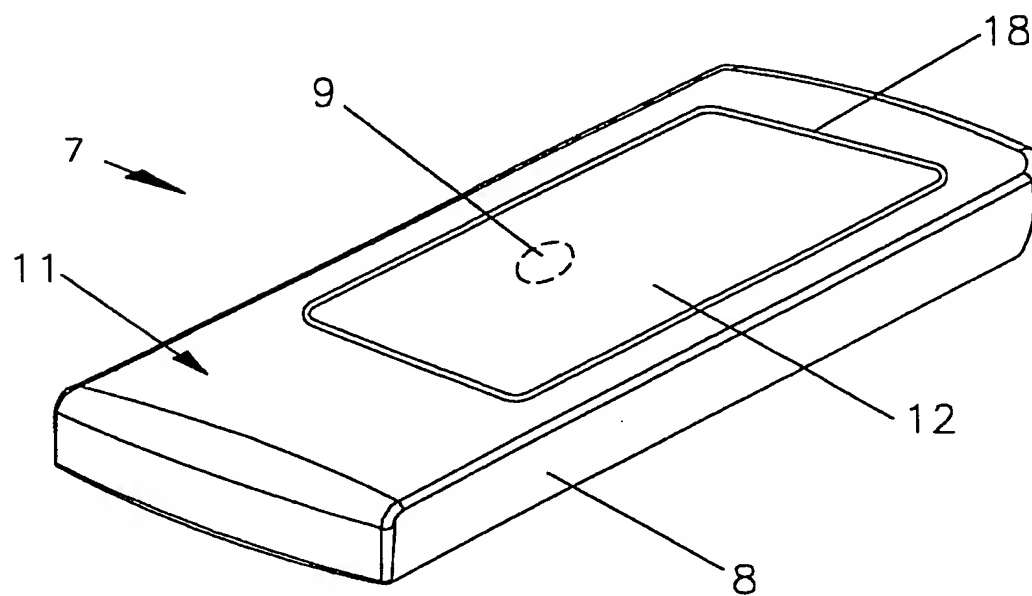


Figure 4



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Figure 5.

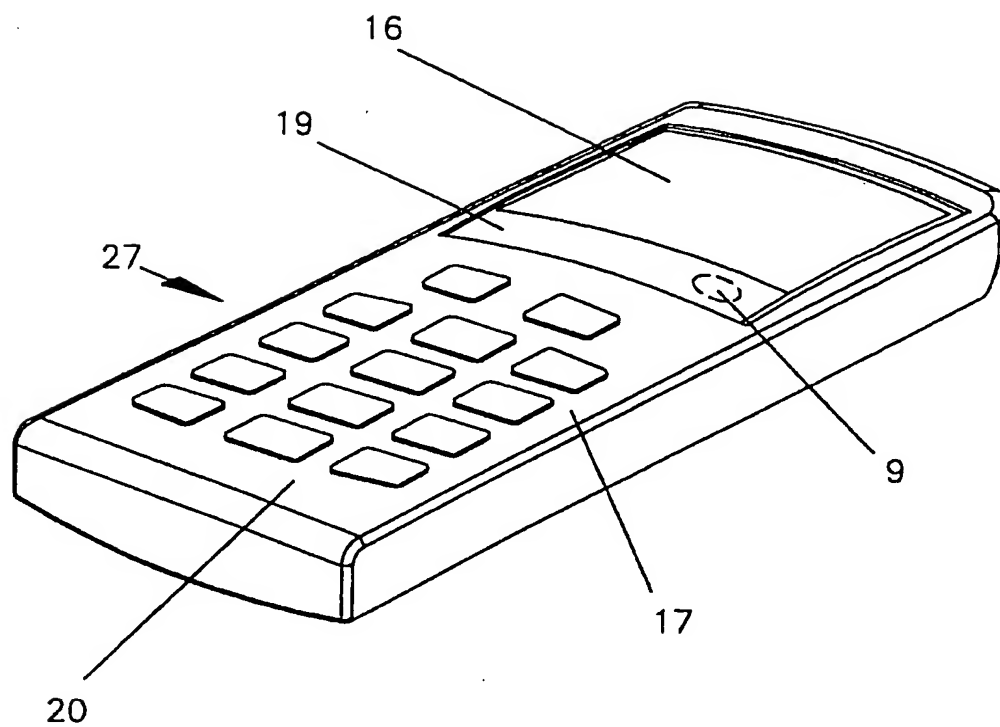
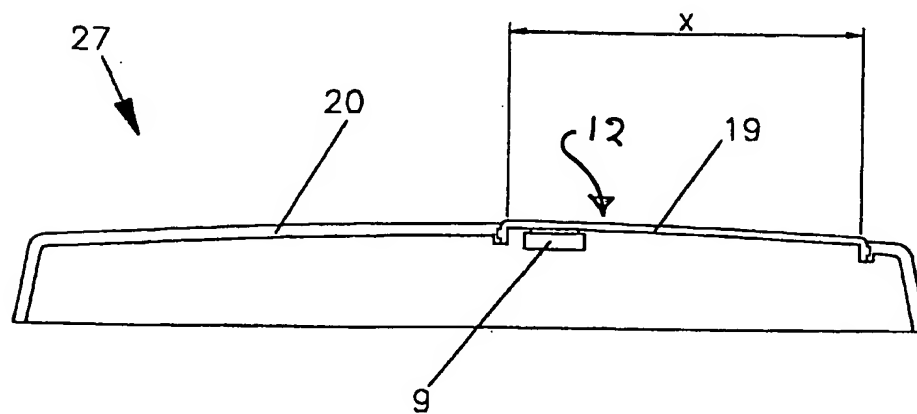


Figure 6



# INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/GB 00/01427

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04R1/02 H04M1/03 G06F1/16 H04R7/04

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

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